

# Odor and Nutrient Management

Summer 2009  
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## Producers Should Check State Law Changes for Confinements

by Karen Grimes, Iowa Department of Natural Resources

As confinement livestock and poultry producers make plans for the future, they should be aware of changes in state law that may affect them. The laws are already in effect or will be in effect shortly.

The Iowa Department of Natural Resources (DNR) has begun drafting rules to implement the laws and is planning to hold two stakeholder meetings in midsummer to gather input on the draft rules. In the meantime, DNR staff is encouraging producers to read the laws because producers are still responsible for meeting the laws' requirements.

Two bills passed this spring by the 83rd Iowa General Assembly could affect producers with confinement (completely roofed) feeding operations.

### Stockpiling Dry Manure

The first, **House File 735**, sets requirements for stockpiling dry manure. The law went into effect when the governor signed the bill on April 2. It establishes setback distances from residences and environmentally sensitive areas. It also sets minimum requirements for covering or protecting stockpiles, depending upon when the confinement feeding operation was built or expanded, and the age of the stockpile.

### Frozen Ground Application

A second bill, **Senate File 432**, has two main provisions. The first provision deals with manure application from confinement feeding operations on frozen or snow-covered ground. This law restricts surface application of liquid manure on frozen or snow-covered ground except in emergencies. It applies only to producers who are required to submit a manure management plan to the DNR. Generally, this includes confinement swine opera-

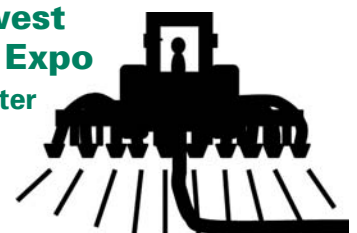
tions housing 1,250 or more finishers and dairy operations with 350 or more mature dairy cows, but is not limited to swine and dairy operations. This provision is effective on July 1, meaning that liquid manure application will be restricted this coming winter.

### Location of Dry Bedded Confinements and Stockpiles

A second provision of Senate File 432 sets requirements for the location of dry bedded confinements and for manure originating from them. A new or expanding dry bedded confinement must be separated from residences and other buildings, and from water sources. There are some additional requirements for buildings and dry bedded manure stockpiles located above vulnerable groundwater areas including karst (primarily in northeast Iowa) and shallow sand and gravel aquifers (generally along streams). Otherwise, the laws for stockpiling dry bedded manure are essentially the same as those that apply to open feedlots (unroofed or partially unroofed animal feeding operations). This provision became effective when the Governor signed the bill on May 26.

Although small animal feeding operations are exempt from some requirements under the new laws, all producers are required to follow minimum manure control requirements to avoid causing water quality violations.

**2009 Upper Midwest  
Manure Handlers Expo**  
Central Iowa Expo Center  
Boone, Iowa  
July 22, 2009



**SET for Fall**  
**Safety, Efficiency & Technology**

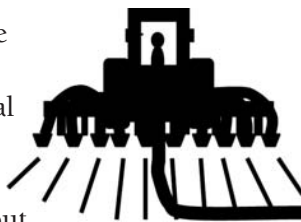
Join us for the 2009 Upper Midwest Manure Handling Expo on July 22 in Boone. The gates open at 8 a.m., with events continuing until 6 p.m. Admission is free and on-site parking is only \$5.



(Upper Midwest Manure Handlers Expo continued from front page)

The Manure Expo provides the opportunity to:

- Participate in two educational sessions held concurrently twice at 9–10:30 a.m. and from 1:15–2:45 p.m. throughout the day. Each educational session includes three seminars.
- See 19 manure application demonstrations. Dry demonstrations will be held from 10:45–11:45 a.m. and Liquid demonstrations will be held from 3–4 p.m.
- See three educational field demonstrations on Spill Response, Leak Detection, and Ruptured Hose Response. Educational demonstrations will be held from 4–4:30 p.m.
- Visit several exhibitor booths and get information about their products and services at any time throughout the day.



Visit: [http://www.ag.iastate.edu/wastemgmt/expo\\_home.htm](http://www.ag.iastate.edu/wastemgmt/expo_home.htm) for an updated exhibitor and sponsorship list and additional Expo details.



### Who Should Come

- Commercial applicators wanting to learn about new equipment, specifications, and regulations or services available
- Producers interested in manure application options and available services
- Certified Crop Advisors working with animal manure nutrient management planning
- Specialists providing nutrient management planning assistance

2009 Upper Midwest Manure Handling Expo  
is presented by

**IOWA STATE UNIVERSITY**  
and  
**Iowa Commercial Nutrient Applicators  
Association**



### Extension Education Sessions

9 – 10:30 a.m.; Sessions 1 & 2 held concurrently  
1:15 – 2:45 p.m.; Sessions 1 & 2 held concurrently

#### Session 1

#### **Managing Biosecurity on Swine Farms During Manure Removal**

*Dr. Rodney Baker, Iowa State University,  
Vet Diagnostic & Production Animal Medicine*

Biosecurity of modern swine farms is increasing in significance as farm sizes have increased and as profitability per pig have decreased. Health maintenance and health improvement are critical issues for pig producers and in most years determine bottom line financial performance. A practical approach to current biosecurity methodologies with an emphasis on manure handling management will be presented.

#### **H<sub>2</sub>S Management During Manure Removal from Swine Deep Pits**

*Dr. Jay Harmon & Mr. Randy Swestka, Iowa State  
University, Ag. & Biosystems Engineering*

Hydrogen sulfide can be a killer during manure pumping events. Attendees will learn about the symptoms of hydrogen sulfide exposure and the keys to reducing H<sub>2</sub>S production during pumping. A discussion of ventilation protocols and pumping strategies to limit H<sub>2</sub>S risks will be included as well as information about a new monitoring system being developed at ISU which could alert users of a potential problem before it becomes a tragic loss.





### Advances in Subsurface Application of Solid Manures

*Dr. Thomas Way, USDA-ARS National Soil Dynamics Laboratory*

This third presentation of Session 1 will cover equipment for subsurface band application of solid manure. The presentation will focus on the prototype subsurface band applicator implement developed at the USDA-ARS laboratory at Auburn, AL. Information about performance of the implement will be presented and the information will include effects of subsurface band application of poultry litter on crop yield, on the potential for reducing nutrients from manure in runoff water, and on emissions of greenhouse gases from land-applied manure. Also, the presentation will include information about a prototype subsurface band applicator implement developed at the USDA-ARS at Booneville, AR and a prototype subsurface applicator implement developed in Saskatchewan, Canada.

### Session 2

#### Iowa CAFO / AFO Regulation Update

*Mr. Jeff Prier & Mr. Gene Tinker, Iowa Department of Natural Resources*

*Certification requirements and Existing Land Application Requirements* – Iowa law requires persons acting as commercial manure applicators and confinement site applicators to meet certification requirements. Applicators will learn what the required separation distances are and what information must be kept to comply with recordkeeping.

*New regulations for manure storage and application in Iowa* – Recent changes in state law have altered the requirements for Iowa producers. These changes include determination of which operations should

apply for a NPDES permit, stockpiling requirements for dry manure from confinement operations, manure application on frozen or snow covered ground and requirements for dry bedded cattle or swine confinement operations.

### Research Review of Solid and Liquid Manure Application on Frozen Ground

*Dr. Jeff Lorimor, Curry-Wille & Associates*

This session will present research results from an ISU study of runoff from corn and bean stubble plots that received winter application of liquid swine manure at different times throughout the winter. It will also present a summary of water quality research results from several different projects in the Midwest that examined the effects of winter application of solid (bedded) manure.

### Managing Manure Application Over Tile

*Dr. Matt Helmers, Iowa State University, Ag. & Biosystems Engineering*

In many areas where liquid manure is applied over tile lines there is a concern about rapid movement of liquid to the tile lines and subsequent movement to downstream waterbodies. This presentation will discuss application conditions that are conducive to this rapid movement and ways to manage manure application to minimize the risk of direct movement to tile lines.



For more information, visit us online at:  
[http://www.ag.iastate.edu/wastemgmt/expo\\_home.htm](http://www.ag.iastate.edu/wastemgmt/expo_home.htm)

(continued on page 4)



(Upper Midwest Manure Handlers Expo continued from page 3)

**S. E. T. for Fall**  
**Safety, Efficiency, and Technology**  
**2009 Upper Midwest Manure Handlers Expo**  
**Central Iowa Expo Center, Boone, Iowa**  
**July 22, 2009**



Manure Expo exhibits will be available for viewing at all times during the day.  
 A time for lunch has been scheduled into the educational program, but it will also be available  
 for purchase throughout the mid-day.

### Expo Activity Schedule

8 a.m. Manure Expo Opens

9 – 10:30 a.m. Concurrent Educational Sessions

#### Session 1

- Managing Biosecurity on Swine Farms During Manure Removal
- H<sub>2</sub>S Management During Manure Removal from Swine Deep Pits
- Advances in Subsurface Application of Solid Manures

#### Session 2

- Iowa CAFO/AFO Regulation Update
- Research Review of Solid and Liquid Manure Application on Frozen Ground
- Managing Manure Application Over Tile

10:45 – 11:45 a.m. Exhibitor Demonstrations, Solids Handling

11:45 – 1:15 p.m. Lunch (available for purchase)

1:15 – 2:45 p.m. Concurrent Educational Sessions

#### Session 1

- Managing Biosecurity on Swine Farms During Manure Removal
- H<sub>2</sub>S Management During Manure Removal from Swine Deep Pits
- Advances in Subsurface Application of Solid Manures

#### Session 2

- Iowa CAFO/AFO Regulation Update
- Research Review of Solid and Liquid Manure Application on Frozen Ground
- Managing Manure Application Over Tile

3 – 4 p.m. Exhibitor Demonstrations, Liquid Handling

4 – 4:30 p.m. Educational Demonstrations, Drag Hose Safety

- Spill Response
- Leak Detection
- Ruptured Hose Response

4:30 -6:30 p.m. Nuhn Quad-Train Ride and Drive  
 Stutsman's Variable Rate Technology with GPS Auto-Steer Ride and Drive

### Mark your calendars for

**2010 Manure Expo**

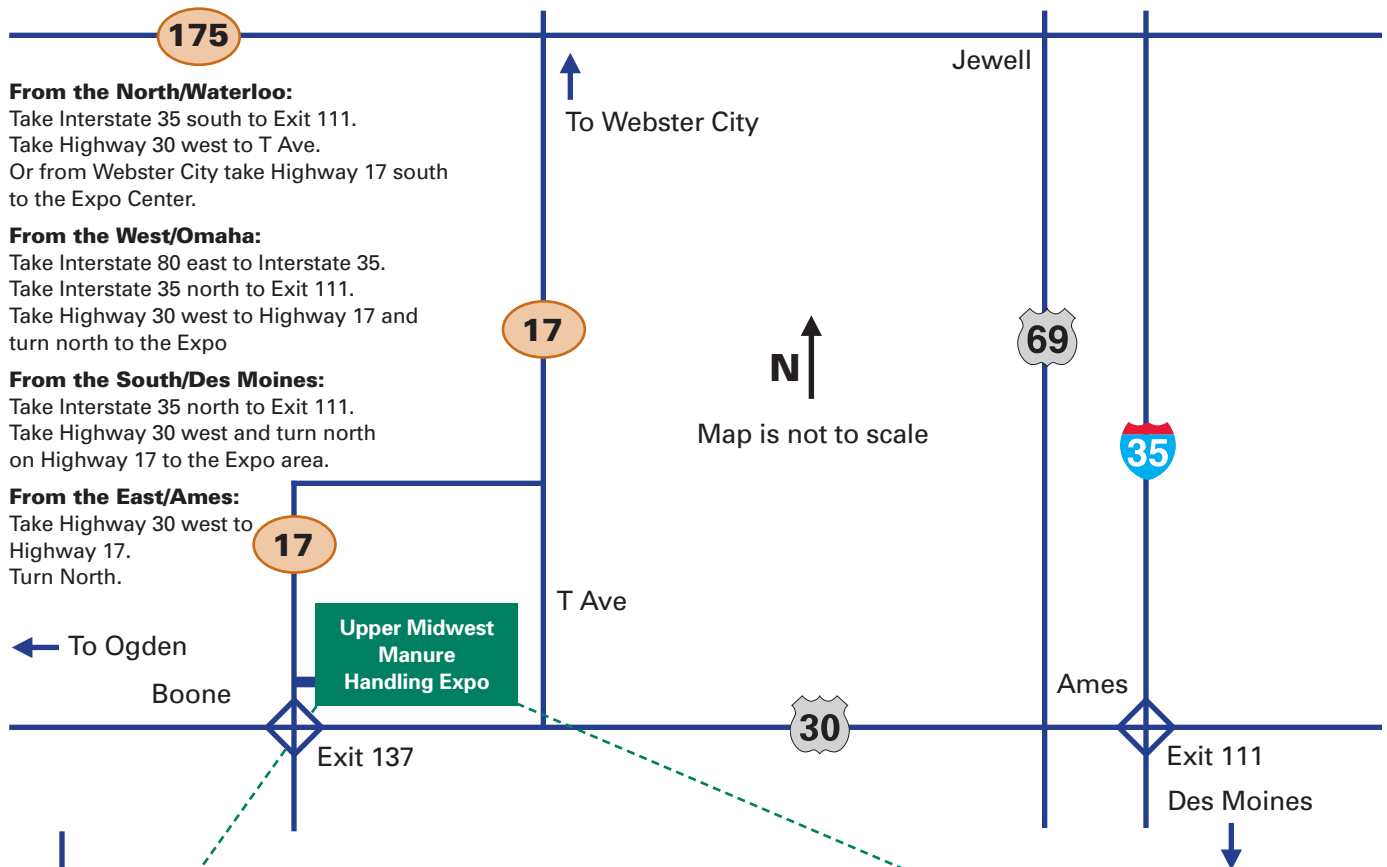
**Balancing Production and Conservation**

**Thursday, July 15, 2010**

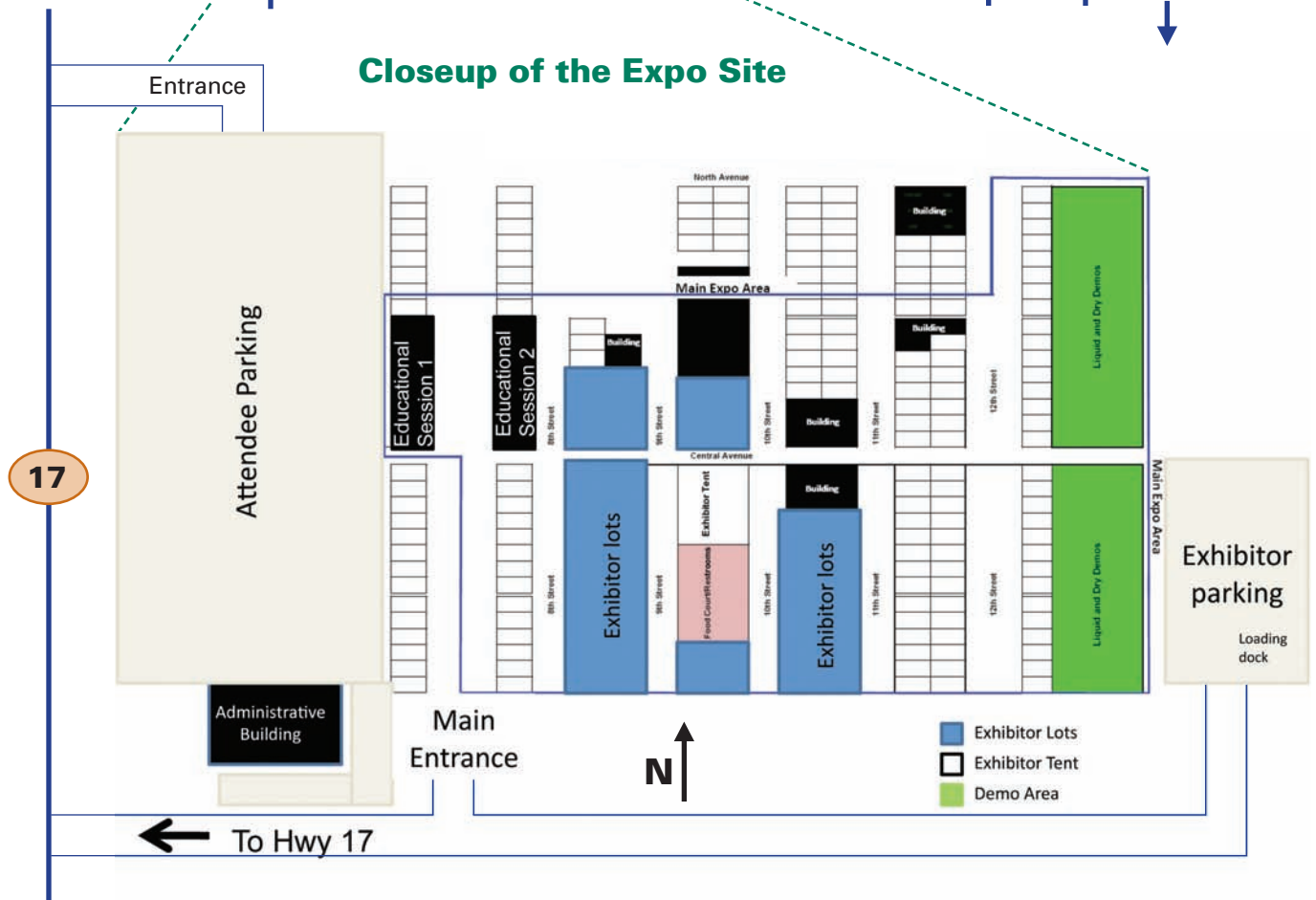
**Penn State Ag Progress Days Facilities, Pennsylvania Furnace, PA**



## Directions to the Expo



## Closeup of the Expo Site







### Schroeder Applies Swine Manure Using Low Disturbance Method

by Jason Johnson, USDA-NRCS, Des Moines

For more than 20 years Plymouth County farmer Tony Schroeder applied swine manure to his cropland using disk blades attached to a honey wagon, leaving less than 20 percent residue cover. But after seeing his neighbor knife in swine manure using a low soil disturbance method three years ago, Schroeder decided this was an application process he should try.

This low disturbance method of knifing swine manure directly into crop rows leaves as much as 70 percent of the soil covered with crop residue. The obvious benefit is erosion reduction, but Schroeder says the low disturbance method also lessens compaction, lowers the risk of manure runoff, allows for more efficient manure application and reduces odor.

Schroeder farms nearly 2,000 acres of corn and soybeans with his father. He also grows oats and operates hay and pastureland. Schroeder feeds 6,000 hogs and 600-800 head of cattle per year, and raises 100 cow-calf pairs annually. His wife, Shirley, has a part-time job in LeMars and finds time on the farm to take care of the nurseries and does the books for the operation. The couple has four boys who also help out on the farm.

He sold some land to a neighbor for hog building space three years ago, with the agreement that Schroeder could use manure from those facilities. The company his neighbor hired to apply manure used a toolbar with a Dietrich shank that Schroeder says is a “knife system with a shovel sweep” that leaves residue on top.

Schroeder hired the same business to apply manure to his soybean ground going into corn, and he was equally impressed. “I said ‘Wow, look at this. It looks like they barely disturbed the soil.’” Schroeder also tried the application on corn stalks. “It worked great in there, too,” he said. “You couldn’t even see where he knifed it in.”



**A Plymouth County soybean field where fall swine manure was applied using the knife and sweep method. This method minimally disturbs the soil surface, leaving approximately 70 percent residue cover.**



**A Plymouth County soybean field where fall swine manure was applied using the disk covering method. This method disturbs the soil surface, leaving approximately 20 percent residue cover.**

### Yields Not Affected

Schroeder was concerned crop yields would drop when he switched to his new system. Yields have not suffered, however, since Schroeder’s switch to a low disturbance manure application three years ago. “I was concerned I would get a yield reduction with the manure underground (not being widespread), but watching the yield monitor, I can’t see it,” he said. “The roots move far enough into the manure zones to get the N, P and K they need. I’m sold on it.”

(continued on page 7)



### Erosion Reduction

Schroeder says it is important to keep the soil covered in Plymouth County, where much of the cropland lies on a seven percent slope or more. While the increased residue cover protects against erosion by water, it also reduces wind erosion. “I used to see big clouds of dirt and dust, but now I’m not seeing wind erosion issues,” he said.

### Less Compaction

While Schroeder’s new system leaves the soil undisturbed, the disk covering system created a mound that Schroeder annually smoothed prior to planting. He says the disk covering system creates sidewall compaction – where disk openers and gauge wheels smear and compact the sides of the seed trench, restricting roots from developing laterally. “That is one less trip across the field I need to make now,” said Schroeder.

### Environmentally Friendly

The low disturbance system knifes the manure into the ground, sealing it up. This dramatically reduces the potential for manure to runoff into nearby streams or rivers. Joel DeJong, ISU Extension field agronomist for Plymouth County, says the disk covering system often shows evidence of manure on the soil surface. “From what I’ve seen, knifed in swine manure is more easily retained than disk-covered manure,” he said.

When it comes to swine manure application, DeJong says a general rule is the more it smells the more you’re probably losing. Knifing manure into the ground also helps reduce odor. Low-disturbance methods seal manure in and don’t allow volatile fatty acids, ammonia and hydrogen sulfide – key components in manure odor – to release into the air.

### Timing Is Key

Schroeder says one challenge with the low disturbance method of applying swine manure is timing. The disk covering system allows producers to break through frozen ground to apply manure, but the low disturbance method of knifing and sweeping does not work on frozen ground. “It’s important to wait to apply manure until after ground temperatures drop to less than 50 degrees so you don’t get the volatilization,” says Schroeder. “On the other hand, you can’t wait until the ground freezes either.”

Schroeder is now a major proponent of the low disturbance method of knifing and sweeping in swine manure. He has worked with Plymouth County District Conservationist Jim Lahn of the USDA’s Natural Resources Conservation Service (NRCS) to promote the system and educate local producers on the benefits. “In some areas of the county you look for a distance and it’s all black because of the disk covering method,” he said. “There is a lot of swine production in this part of the state, which is good and that’s a good source for fertility, but we can apply the manure in a more environmentally friendly way.”

For more information about the best way to apply manure on your cropland, visit your local NRCS or ISU Extension office today.

## Hydrogen Sulfide Detection System for Slurry Applicators

by Ross Muhlbauer and Randy Swestka, Department of Agricultural and Biosystems Engineering, Iowa State University

Each year swine are lost to hydrogen sulfide ( $H_2S$ ) poisoning from unexpected burst releases during slurry removal from deep pit swine housing. Commercial slurry applicators, producers and previous research agree that increased ventilation can be required to dissipate dangerous  $H_2S$  bursts that occur during pump-out events. However, continuous increased ventilation during cold weather can lead to increased heating costs and stressful conditions impacting swine health. Previous research has also shown that  $H_2S$  concentrations can change from harmless to dangerous in a matter of minutes. It is this burst characteristic of  $H_2S$  gas releases within the pit that create the danger.

The ability for applicators and producers to monitor  $H_2S$  levels during slurry removal would be beneficial. Instead of utilizing high ventilation at precautionary levels or low ventilation to reduce costs and to reduce animal stress, ventilation could be adjusted accordingly to disperse  $H_2S$  gas and decrease the chance of swine loss. Although it is never recommended a person enter a swine house during slurry agitation, monitoring  $H_2S$  levels and managing ventilation and agitation techniques to prevent hazardous

(continued on page 8)



(Confinement Site Workshops continued from front page)



The handheld receiver (left) is used by the operator outside the swine facility to monitor the H<sub>2</sub>S concentration measured by the sensor inside the facility. A receiver alarm light and beeper activate when an operator-programmed concentration is detected by the sensor inside the swine house.

conditions could also increase human safety in the event of inadvertent entry. Previously, no system had been developed for manure applicators and producers to safely and remotely detect H<sub>2</sub>S gases in swine housing.

The Agricultural Waste Management Laboratory in the Agricultural and Biosystems Engineering Department at Iowa State University developed a portable, wireless H<sub>2</sub>S detection system for use in swine production systems during manure agitation and removal from under-floor swine slurry storage pits. Initially, multiple commercially available H<sub>2</sub>S sensors were tested in a controlled laboratory environment. From those results a prototype wireless H<sub>2</sub>S detection system was developed for testing in swine housing by commercial slurry applicators.

A two-piece prototype consisting of a battery operated sensor/transmitter and receiver was constructed.

- The sensor/transmitter is placed in the swine housing area before agitation/removal begins; the operator can then monitor H<sub>2</sub>S concentrations from outside the building.
- An operator-programmed visual/audio alarm can be set to activate at a desired concentration to alert the operator of dangerous H<sub>2</sub>S conditions.
- Once alerted, the operator can take action to dissipate the H<sub>2</sub>S gas. Research has shown H<sub>2</sub>S gas can be dispersed by stopping agitation and increasing ventilation.



The sensor/transmitter placed on the slats measures H<sub>2</sub>S gas levels at that location in a swine finishing facility prior to sub-floor slurry agitation and removal.

The prototype detection system was field tested in swine confinements where it was used to detect H<sub>2</sub>S gas bursts during agitation of sub-floor slurry pits. Besides a quick reaction time, it showed good accuracy when tested against laboratory H<sub>2</sub>S measurement equipment. Testing confirmed that if monitored, dangerous levels of H<sub>2</sub>S gas can be dissipated by adjusting ventilation during slurry agitation and removal. This testing also showed that eliminating above surface slurry agitation greatly reduces H<sub>2</sub>S burst releases.

Portable H<sub>2</sub>S detection system prototypes are currently being used by two commercial slurry applicators during slurry application events from swine housing with sub-floor slurry storage. A data recorder within each prototype collects information on sensor run-time and H<sub>2</sub>S exposure. The units are being evaluated for durability, effectiveness, accuracy drift, and user-friendliness.

So far the units have performed well but limitations have been identified. The system is limited by its single point monitoring scheme. While the system monitors H<sub>2</sub>S concentration at one point, dangerous levels could be present elsewhere in the swine house. During testing, methods were devised to minimize this problem. Use of interior circulation fans equalized H<sub>2</sub>S concentrations in the building, thus increasing the effectiveness of the single point monitoring scheme.





The portable H<sub>2</sub>S detection system is intended for use by custom manure applicators and producers that handle their own slurry. The portable system is battery powered so it can be easily transported and it requires minimal setup. The battery lasts 14 hours which would be compatible with most slurry removal events. The sensor/transmitter is placed inside the swine house before slurry removal. The H<sub>2</sub>S concentration can then be monitored by the operator from outside the building via the receiver.

With the sensor/transmitter in the swine house the signal can be received via the receiver unit up to approximately 400 feet from the building. The range increases to approximately 2 miles line-of-site with long range antennas. The receiver unit can be configured for internal battery or connection to a vehicle accessory DC power outlet making it ideal for use in a vehicle or carried around a site.

Additional information about the wireless H<sub>2</sub>S detection system will be provided during an educational session at the 2009 Upper Midwest Manure Handling Expo in Boone, Iowa ([http://www.ag.iastate.edu/wastemgmt/expo\\_home.htm](http://www.ag.iastate.edu/wastemgmt/expo_home.htm)). Results from field testing and H<sub>2</sub>S mitigation techniques will also be discussed by the development team.

For additional information regarding this sensor please contact:

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